

Developing Learning Outcomes to be Recognized Profession Competencies

Case Study in Bachelor (D-III) Electronic Technology Study Program

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Abstract—The establishment of The ASEAN Economic Community (AEC) 2015 allows skilled labour, goods and services product flow freely in the member countries. This situation has increased the importance of recognizing skills of migrant workers. Skills development for meeting a certain job in a profession and recognition will play an important role in meeting the challenges in the implementing the AEC. The skills recognition has expressed with profession certificate ownership. The main problems is Polytechnic as a Higher Vocational Education doesn't develop yet their learning outcomes to be recognized as profession competencies for the students. This study aims to find out the model of profession competencies development by recognizing these competencies achievement. This model was developed from Learning Outcomes of Study Program D-III Electronics Technology (Bachelor Program). Certification aims to increasing the bargaining position of graduates in the transition time from education world to the world of work. Qualitative method used mainly in this research. Data collected by an expert panel, direct observation, document tracer, and interview as necessary. Three strategic industries in Bandung, experts, and Profession Certification National Board (BNSP) has involved in this research. This study revealed that the conceptual model of profession certification can be developed from learning outcomes by selecting, aligning and developing it to be profession competencies standard to do a job in industries. These competencies can be recognized by collaborating between Polytechnic, association profession (expert team) and BNSP. Certification can be awarded to students during the academic course.

Keywords—*Learning Outcomes; profession competencies; recognition; certificate*

I. INTRODUCTION

The issue of Higher Education Quality Assurance is one of the actual issues in the last five years. The quality assurance has been discussed intensively since the establishment of ASEAN Economic Community (AEC) in 2015. AEC aims to create economic integration, a single market production base, and to be a free flow of skilled labour in the region of their country member. It does mean that competencies development and recognition will play a critical role in meeting the challenge of AEC implementation. Preparing human resource through polytechnic education to meet the market should consider the history of polytechnics establishment.

Polytechnic is a Higher Vocational Education institution [1]. The establishment of HVE or Polytechnic (1978) has intended to fill skilled workers in the middle level that is a level between low-skilled workers and engineers in the workplace. The education characterized by offering the narrow sets of skills training programs. Curriculum designed by the government to be matched with the needs of the jobs. The early 2000s government gave every HE and Polytechnic the opportunity to insert the local content in their curriculum. This curriculum has been directed to the mastery of science, technology, and arts. In the same time, Polytechnic has mushroomed. The flourish of Polytechnics began emerging quality problems.

The second generation of Polytechnic curriculum (2002) mostly developed based on competencies for the wide areas of knowledge. This was pursued by polytechnics because occupational patterns and job qualification have changed rapidly, and many new jobs were created so the graduates must have extensive knowledge to be compatible with new job and situation in the workplace. This strategic has caused difficulties for the polytechnic to determine the qualification standard of its graduate.

The quality assurance has become actual issues in the last five years. The government responded this issue by issuing regulations number 049 /2014 was revised to be number 044/2015, about the National Standard of Higher Education and regulation number 50/2015 (it was revised to be number 62/2016) about Quality Assurance Standard. The quality standard of graduate has developed based on Indonesian Qualification Framework (IQF) which has 9 levels [2]. In 2015 polytechnic's curriculum has been revised to be matched with IQF standard. Curriculum designed based on learning outcomes. In other words, learning materials should refer to these learning outcomes, tools of assessment should be aligned with learning outcomes, learning and teaching method should be chosen to help the students reach the learning outcomes.

The recognition of standard graduate competencies is the other problem of polytechnic that should be solved. It is a crucial thing to raise the bargain and ensure of graduates. Now many polytechnics offer a certification program for all study programs. This program is not always matched with the specific skills and knowledge that they have studied. This study

suggests the model of competencies recognition that can be developed from the learning outcomes standard.

II. LEARNING OUTCOMES AND PROFESSIONALIZATION

A. Learning Outcomes, Competency, and Competence

A learning outcome is a formulation of competency. Competency has many definitions. Competencies are the characteristics of an individual that leads to the demonstration of skills and abilities which result in effective performance within an occupation area. Competency also embodies the capacity to transfer skills and abilities from one area to another [3]. A Competency has three elements that are skills, knowledge, and attitudes [1]. Sanghi said that competency and competence are two different words that in practice often exchange. Competence means skills and standard of performance reached, while competency refers to behaviour by which it is reached. Competencies refer to the range of skills which are satisfactorily performed, while competencies refer to the behaviour adopted in competence performance [3]. The plural of each word, therefore, gives two different meanings. Spencer and Spencer [4] have defined competency as an underlying characteristic of an individual that is causally related to criterion-reference effective and/or superior performance in a job or situation. Underlying characteristic means the competency is fairly deep and enduring part of a person's personality and can predict behavior in the wide variety of situation and job task; causally related means that a competency causes or predict behavior and performance; and criterion-reference means that the competency actually predicts who does something well or poorly, as measured by a specific criterion or standard. Further Spencer & Spencer wrote that competency as an underlying characteristic has five types of characteristics:

1. Motives: The think a person consistently thinks about or wants that which causes action. Motives drive direct or select behaviour towards certain actions or goals and away from others.
2. Traits: physical characteristic and consistent responses to situation or information.
3. Self-concept: a person's attitudes, values, or self-image.
4. Knowledge: Information a person has in the specific content area.
5. Skills: an ability to perform a certain physical or mental task.



Fig. 1. Iceberg Model of Competency [4]

These characteristics can be illustrated as shown in Figure 1 & 2. Knowledge and skills tend to be visible and relatively “on surface” characteristics of people, while self-concept, traits and motives are more hidden, deeper, and central to personality. Surface knowledge and skills competencies are relatively easy to develop; training is most effective way to secure these employee abilities. Core motive and trait competencies are more difficult to assess and develop.

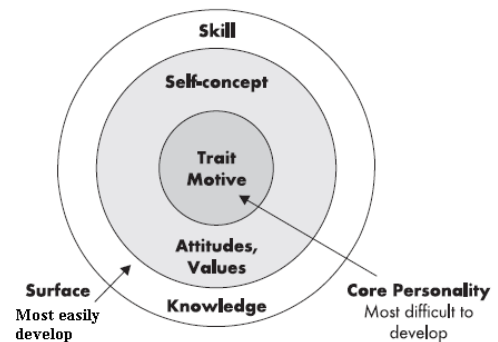


Fig. 2. Central and Surface competencies [4]

Competencies can be defined as skills, the area of knowledge, attitudes and abilities that distinguish high performers. There are characteristics that may not be easy to observable but behavioural questions can help draw out examples of these competencies. It is illustrated in Figure 3. Competencies are components of a job which are reflected in behaviour that is observable in a workplace.



Fig. 3. Questions to draw out the “hidden” characteristics of competencies [3]

Competencies measurement and performance measurement are two words that may interchangeable. Competencies are all about being qualified to do the work in a particular position. Performance is the result of the actual work.

B. Competency Development

The important thing today for the educational program is the changing of the workforce that characterized by increasing

competition for a job and qualities that are valued by employers in the industry. There are 7 items which are valued and support employees to be successful in their career: 1) critical thinking ability, 2) generating hypothesis and linking ideas, 3) applying theory into practice, 4) sharp analytical skills, 5) prioritizing problems, keeping-up-to-date information regarding professionalism, 6) giving clear explanation about problems and treatments, and 7) recognizing the effect the decision to be made [7]. It is a market signal that has to be noted by Polytechnic and other Vocational Education Institution. The competencies needed in the workplace are not too technical and specific or narrow skills. The important and valued thing for graduates is a recognizing of their ability and skills at least for a specific competency besides academic recognition.

Other research about competency development revealed that the employee participation in competencies development initiatives, perceive support for competency development is positively associated with workers perception of employability. Moreover, self-perceived employability is positively related to career satisfaction and perceived marketability [5]. It indicates that competencies development needs support from individual itself and it is related to a successful career in the workplace. Analogous with this revealed, learning outcomes development to be a professional competency should be supported by student participation and academic success.

C. Core Competencies

According to the survey of ASEAN employers on skills and competitiveness in 2014, employers report that they more likely to invest in programs to build capacity around management and leadership skills [6]. These types of skills are part of core competencies, reflecting the needs and a crucial thing of the recognition and reference for core competencies in this region. Core competencies are the collection of skills, knowledge and attitudes that are needed for all workplaces to operate effectively. The skills of workers are critical to enterprises' productivity and competitiveness, as well as workers' own employability.

D. Professionalization

Professionalization is the process by which occupations seek to gain status and privilege in accord with the professionalism. Johnson (1972, 1984) said professionalism as an ideology as quoted by Eraut [8]. The professions are a group of occupations the boundary of which is ill-defined. In the early 2000s, Eraut wrote in his book that arguments and characteristics of the profession are determined by a view of the senior profession. Goode (1969), Merton (1950), and Parson (1968) have developed the concept of the profession which is quoted by Eraut in his book. He developed this concept to provide social control of expertise. Experts are needed to guarantee the safety and good services.

Determining the knowledge-based of the profession is a difficult task. It is necessary to understand the types of knowledge and the role of each type in professional action. There are propositional knowledge, personal knowledge, and process knowledge. The process knowledge consists of procedural knowledge and "know-how". Propositional

knowledge is used for establishing syllabus of education or training. It consists of replication and application knowledge. Replication knowledge is used to get presented for assessment in the education context. Knowledge use in the application mode implies working with rules or procedures. People naturally develop some constructs, perspectives, and frames of reference which are essentially personal, even if they have been influenced by public concepts and ideas in their community. Process knowledge includes knowing how to access and make good use of propositional knowledge in this context can be defined as knowing how to conduct the various processes that contribute to professional action. Five kinds of process knowledge for professional action have been identified. There are: 1) acquiring information: it is a process that involves the use of recognized methods of inquiry; 2) skilled behaviour is practical knowledge combined with ability. It is a complex sequence of activities which has become so routine through practice and experience that it is performed almost automatically; 3) deliberative processes such as planning, problem-solving, analyzing, evaluating and decision-making. It is the heart of professional work. These works require a unique combination of propositional knowledge, situational knowledge and professional judgment; 4) giving information to clients. It is a major part of the role of many professionals, that their performance could be improved; 5) meta-process for directing and controlling one's own behaviour. The term of meta-process is used to describe thinking involved in directing one's own behaviour and controlling one's engagement.

E. Design competency study

There are three alternative methods for the design of competency study:

1. The classic study design using criterion samples
2. A short study design using expert panels
3. Studies of single incumbent and future jobs where they are not enough jobholders to offer samples of superior and average performance

This study used a short study method using expert panels to develop the model. The steps of study have been adopted and modified from Spencer & Spencer [4] which is still suited to this study. The steps are:

1. Convene expert panels
2. Conduct behavioural interview
3. Analyze and develop competency model
4. Validate the competency model

The study has been started by mapping the competencies which are developed from the learning outcomes. Data collected by tracing curriculum documents. The mapping results in information about learning outcomes which are possible to develop competencies that can be recognized by BNSP through the certification process. These competencies will be developed to be competency units which are characterized by the amount of criterion for a sample job in the next step research. These criterion developed by using the behavioural interview. All data collected and analyzed to get a model of competency development. This model validated by experts' panel and BNSP.

III. DEVELOPING PROFESSIONALIZATION & CERTIFICATION MODEL

A. Mapping and Aligning Learning outcomes

The Study Program D-III Electronic Technology has been determined as a case study in this research. It is a three-year education program in polytechnic. Learning outcomes of this program are mapped in each year and aligned with the work areas and work qualifications needed. Figure.4 to Figure.6 shows this mapping.

Year	Learning Outcomes	Work areas	Qualification needed
I	Mastery in basic electrical, electronic, and applied physic, use applied mathematics to analyze and solve electronics problems, use electronic instruments to test circuit by using safety principle and procedure, use language to effective communication, responsible for individual and group tasks	1. Test and measurement circuit and electronics equipments 2. Product QC of electronics components, circuits, and equipments	1. Job safety analysis 2. Use safety principle and procedure in all process of work 3. Use electronic instruments and equipments for measurements by considering safety principles and procedures 4. Writing technical report completely (with analysis and conclusion or recommendation)

Fig. 4. Learning Outcomes Mapping in the First Year

Year	Learning Outcomes	Work areas	Qualification needed
II	Mastery in analog and digital technology concept theoretic, analyze analog and digital circuit, programming, maintenance and repair electronic circuits and systems, design electronic circuits for control system and instrumentation by using PLC and considering safety principles and procedures	1. Calibrating electronics instruments 2. Product QC of electronics components, circuits, and equipments 3. Practical in control design 4. Setting control system for specific plan 5. Design and realization automation system 6. Read and realized circuit design for SCADA HMI	1. Job safety analysis 2. Use safety principle and procedure in all process of work 3. Use electronic instrumentations & equipments 4. PCB design according to the job electronics circuit diagrams 5. Test and analysis in electronics & basic electric circuit based on measurement data, theories, and knowledge of work 6. Writing technical report completely (with analysis and conclusion or recommendation)

Fig. 5. Learning Outcomes Mapping in the second Year

Year	Learning Outcomes	Work areas	Qualification needed
III	Applied skills and knowledge in workplace. Design final project	1. Calibrating electronics instruments 2. Product QC of electronics components, circuits, and equipments 3. Practical in control design for specific plan 4. Setting control system for specific plan 5. Design and realization automation system 6. Read and realized circuit design for SCADA HMI	1. Job safety analysis 2. Use safety principle and procedure in all process of work 3. Use electronic instrumentations & equipments 4. PCB design according to the job electronics circuit diagrams 5. Test and analysis in electronics & basic electric circuit based on measurement data, theories, and knowledge of work 6. Writing technical report completely (with analysis and conclusion or recommendation)

Fig. 6. Learning Outcomes Mapping in the Third Year

Data collected by tracing curriculum documents [9] and interviewing supervisors as well discuss with experts. These mappings show that it is possible to develop learning outcomes to be competencies standard in the work area. Next step of

study is determining a job sample and identifying criterion required to do that job. It is used to establish competency level and predicts minimal success in that job. The criterion of each competency collected by:

1. Direct observation: employees are directly observed performing (critical) job task and their behaviours are coded for competencies
2. Expert panel: A panel brainstormed and formulated personal characteristics employees need to perform the job at minimal acceptable or threshold level.
3. Interview as necessary. This method was used to identify and describe the most critical situation they have encounter in their job.

This method can be duplicated for another selected job in the same area of work.

B. Analyze data and develop model

All data from all sources are analyzed to identify criterions and skills competencies to do jobs. These criterions and skills also can be used to distinguish between superior and average performers as well work level. Analysis use a thematic approach that consists of three steps: 1) form analysis team by involving experts; 2) individual analysis of the interview. Each analyst works independently; 3) team discuss and determine the competencies needed to do jobs. The result of this analysis is used to develop model conceptual certification of competency from learning outcomes.

C. Developing Learning Outcomes

Refer to the Indonesian Qualification Framework (IQF), description of professionalism, and Elkin's Model of competency development which has quoted by Eraut, the Learning Outcomes are developed as shown in Figure.7

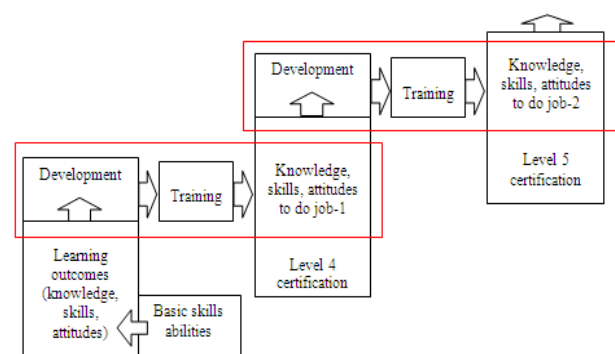


Fig. 7. LO Development Model

Individual competencies should be developed continuously. It is a part of professionalization. Graduate's qualification of Study Program D-III Electronics Technology is equivalent to the level-5 IQF. Based on the result of documents tracing and survey in this research, it shows that some learning outcomes can be developed to become a professional competence. The problem now is who will recognize their abilities? How to get this recognition? Is there an opportunity for the students to get a professional competence during the academic course?

D. Process of professionalization

On the rising demand for technicians, work-force flexibility requirements will almost certainly demand a higher base level of education, better knowledge of work, and new technology literacy especially IT. Polytechnic’s graduate competencies are formulated in the description of learning outcomes. These learning outcomes have been formulated and defined through a Forum Group Discussion (FGD). It has been standardized at the entry level in a certain area of work but not specified for a certain job. In other words, these standards could not be fulfilled professional qualification. It is a dilemma. In one site, polytechnic’s graduate should have competencies which are flexible with new situation and technology, on the other site it has to match with the job. The questions are: is it necessary to design a study program which is focused on a certain job to become qualified in that job? If the answer is “yes”, which is job should be selected? Who should recognize their competencies qualification? If these competencies could not be recognized, should we adjust that polytechnic education was not relevant to the demand and requirement of the work-force?

The professional process is not an instant process. Professional processes, which are not extremely rapid, usually involve an integrated mixture of types of knowledge and mode of cognition that is difficult to unravel. The development of professional knowledge depends on continuing capacity and disposition to learn from the experience of complex problems and situations cases which many professionals have to handle. So, the professional process is a continuum professional learning at which individual professionals become qualified in a formal and recognized by public manner (see Figure.7). Recognition process has to involve the experts, a professional certification board, and Polytechnic, as well a training provider as necessary. The discussion within expert panel result the model of competencies development and recognition process is shown in Figure.8

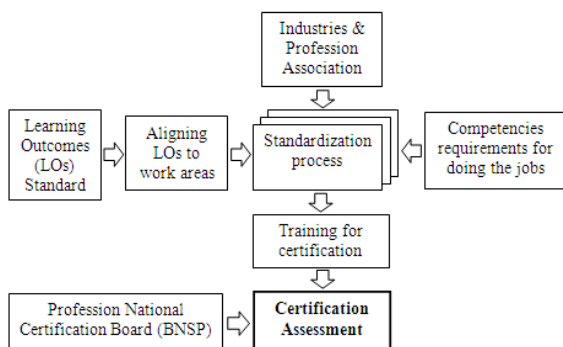


Fig. 8. Model of Recognition Process of Developed LOs.

Profession competencies recognition process was started by aligning the learning outcomes to work areas. In this step, the learning outcomes were selected to support the fulfilling of competencies required of job sample in that work areas. The selected learning outcomes have to be standardized to be matched with that job. Usually, the students need to be trained in order to be matched with the work standards. The selection

of learning outcomes has to consider if a job mainly relationship with machine or people (clients). The higher the level of the job the more he or she relates to the clients or person, and more needs interpersonal competencies than technical competencies. Technical competencies can be developed by training. The interpersonal competencies are more difficult to develop the technical competencies. It is influenced by several factors such as environment which he or she lives and grown, life or work experiences, knowledge which he or she got, etc [10]. The selected competencies and then compiled into a standard of competencies for a job. Figure 4 to Figure 6 shows opportunity to develop learning outcomes to be standard competencies for several jobs. So, students can choose one or more certification programs during their academic course.

The last step of the process is certification assessment by BNSP. If he or she has knowledge, skills and attitudes which suit to the BNSP standard, he or she will be awarded a certificate. Implementation of this model needs good collaboration between education institution (Polytechnic in this case), industries, professional association, and certification board.

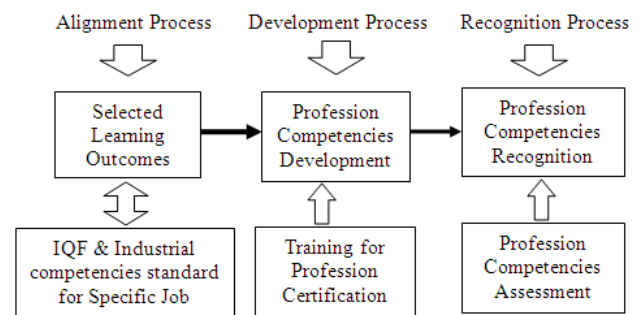


Fig. 9. Conceptual Model of LO Development to be Professional Competencies

According to the result of document tracking and expert discussion, it can be understood that learning outcomes are focused on the understanding of knowledge, basic skills and attitudes building that which is not yet fulfilling professional competencies standard for jobs. It needs to be trained by experts to form as especially the professional attitudes. These attitudes have characteristics consistency and persistence to the standard of work include target and quality of work product, individual and team responsibilities, honesty and committed. The two last attitudes are strongly recommended by industries.

E. Validate model

The last step of this research is model validation. Model conceptual derived in step 3 should be validated by ranking criterion sample of the performer on competencies identified in step 2. Finally, model validated through FGD.

IV. CONCLUSION

Learning outcomes can be developed to be profession competencies by sorting, selecting, and aligning them to the job requirement in the workplace. These competencies should

be standardized to be matched with the work competencies standard requirement. This process involves industries, experts, and Profession Certification National Board (BNSP). It needs good collaboration between Polytechnic, industries, professional communities, experts, and certification board. Skills and knowledge needed can be improved by training or apprenticeship activities. This training aims to sharpen the work skills. Interpersonal skills are the most difficult element of competency to be developed. It relates to individual characters, an environment which he or she lives and grown, life or work experiences, knowledge which he or she got before.

Certification of specific competence can be awarded to students during their academic course. In another word, it doesn't need to implement vocational education program which is too narrow competencies to sharpen competencies.

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